

WHAT IS CLAIMED IS:

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1. A method of forming a nitride-based semiconductor layer, comprising the steps of:

5 growing a buffer layer of $\text{Al}_x\text{Ga}_{1-x}\text{N}$ ($0 \leq x \leq 1$) on a substrate at a growth rate of at least 7 Å/sec; and

growing a nitride-based semiconductor layer of $\text{Al}_a\text{B}_b\text{In}_c\text{Tl}_d\text{Ga}_{1-a-b-c-d}\text{N}$ ($0 \leq a < 1$, $0 \leq b < 1$, $0 \leq c < 1$, $0 \leq d < 1$, $a+b+c+d < 1$) on said buffer layer.

10 2. The method of forming a nitride-based semiconductor layer according to claim 1, wherein

said step of growing the buffer layer comprises growing said buffer layer at a growth rate of at most 51 Å/sec.

15 3. The method of forming a nitride-based semiconductor layer according to claim 1, wherein

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said step of growing the buffer layer comprises growing said buffer layer at a growth rate in the range from 16 Å/sec
20 to 42 Å/sec.

4. The method of forming a nitride-based semiconductor layer according to claim 1, wherein

said step of growing the buffer layer comprises growing
25 said buffer layer at a growth rate in the range from 25 Å/sec

to 29 Å/sec.

5. The method of forming a nitride-based semiconductor layer according to claim 1, wherein

said step of growing the buffer layer comprises adjusting the growth rate of said buffer layer by the supply amount of a group III element supplied at the time of growing said buffer layer.

6. The method of forming a nitride-based semiconductor layer according to claim 1, wherein

said step of growing the buffer layer comprises growing said buffer layer to have a film thickness in the range from 50 Å to 300 Å.

7. The method of forming a nitride-based semiconductor layer according to claim 1, wherein

said step of growing the buffer layer comprises growing said buffer layer to have a film thickness in the range from 100 Å to 200 Å.

8. The method of forming a nitride-based semiconductor layer according to claim 1, wherein

said step of growing the buffer layer comprises growing said buffer layer at a substrate temperature in the range from

500°C to 700°C.

9. The method of forming a nitride-based semiconductor layer according to claim 1, wherein

5 said step of growing the buffer layer comprises growing said buffer layer at a substrate temperature in the range from 550°C to 650°C.

10. A method of manufacturing a nitride-based semiconductor device, comprising the steps of:

growing a buffer layer of $\text{Al}_x\text{Ga}_{1-x}\text{N}$ ($0 \leq x \leq 1$) on a substrate at a growth rate of at least 7 Å/sec; and

growing a nitride-based semiconductor layer including an active device region on said buffer layer and made of $\text{Al}_a\text{B}_b\text{In}_c\text{Tl}_d\text{Ga}_{1-a-b-c-d}\text{N}$ ($0 \leq a < 1$, $0 \leq b < 1$, $0 \leq c < 1$, $0 \leq d < 1$, $a+b+c+d < 1$) on said buffer layer.

11. The method of manufacturing a nitride-based semiconductor device according to claim 10, wherein

20 said step of growing the buffer layer comprises growing said buffer layer at a growth rate of at most 51 Å/sec.

12. The method of manufacturing a nitride-based semiconductor device according to claim 10, wherein

25 said step of growing the buffer layer comprises growing

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said buffer layer at a growth rate in the range from 16 Å/sec to 42Å/sec.

13. The method of manufacturing a nitride-based semiconductor device according to claim 10, wherein

said step of growing the buffer layer comprises growing said buffer layer at a growth rate in the range from 25 Å/sec to 29 Å/sec.

14. The method of manufacturing a nitride-based semiconductor device according to claim 10, wherein

said step of growing the buffer layer comprises adjusting the growth rate of said buffer layer by adjusting the supply amount of a group III element supplied at the time of growing said buffer layer.

15. The method of manufacturing a nitride-based semiconductor device according to claim 10, wherein

said step of growing the buffer layer comprises growing said buffer layer to have a film thickness in the range from 50 Å to 300 Å. A

16. The method of manufacturing a nitride-based semiconductor device according to claim 10, wherein

said step of growing the buffer layer comprises growing

said buffer layer at a substrate temperature in the range from 500°C to 700°C.

17. The method of manufacturing a nitride-based semiconductor device according to claim 10, wherein

said step of growing the nitride-based semiconductor layer comprises forming as said active device region a light emitting layer or an active layer in a semiconductor light emitting device, a core layer in a waveguide device, an I layer in a PIN photodiode, a pn junction portion in a photodiode or a hetero-junction bipolar transistor or a channel portion in a field effect transistor.

18. The method of manufacturing a nitride-based semiconductor device according to claim 10, wherein

said step of growing the nitride-based semiconductor layer comprises forming a cladding layer of a first conductivity type, an active layer and a cladding layer of a second conductivity type in this order.